

CSE 322
Intro to Formal Models in CS
Course Outline

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Core material outlined below usually constitutes most of the course work. Some selection of optional material marked below or other topics fills the rest.

1. Alphabets, strings, languages; operations on them.
2. Ways of formally defining models; states, transitions, acceptance, etc.; nondeterminism.
3. Finite Automata and Regular Expressions (4-5 weeks).
 - (a) Deterministic and non-deterministic FA.
 - (b) ϵ -moves.
 - (c) Regular expressions.
 - (d) Right-, and left-linear grammars
 - (e) Equivalence of all of these.
 - (f) Pumping lemma.
 - (g) Closure under $\cup, \cap, \cdot, *, \neg$.
 - (h) Optional: two-way FA, transducers, other closure results, state minimization.
4. Context-Free Grammars and Pushdown Automata (4-5 weeks)
 - (a) Grammars, derivations, derivation trees, ambiguity.
 - (b) PDA's and DPDA's.
 - (c) Equivalence of CFG's and PDA's.
 - (d) Pumping Lemma.
 - (e) Closure under $\cup, \cdot, *$; *non*-closure under \cap .
 - (f) Introduction to parsing.
 - (g) Optional: Grammar manipulations: useless rules, Chomsky & Greibach forms; Ogden's lemma; linear CFL's; variations on acceptance in PDA's; Cocke-Kasami-Younger Algorithm; closure under \cap -with-regular-set; other closure results.
5. Optional: Turing Machines and Decidability (1–2 weeks; this material is covered in more depth in 431)
 - (a) Definitions.
 - (b) Church-Turing Thesis.
 - (c) Halting Problem.
 - (d) Optional: variations on TM's, an undecidable grammar problem, e.g. CFG intersection = \emptyset , Post's correspondence problem.
6. Optional: general phrase-structure and context-sensitive grammars, Chomsky hierarchy.